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EXAMINER	
VALENTINE, JAMI M	

ART UNIT	PAPER NUMBER
2815	

MAIL DATE	DELIVERY MODE
10/18/2007	PAPER

Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Office Action Summary

Application No.

10/529,851

Applicant(s)

SUEMITSU ET AL.

Examiner

Jami M. Valentine, Ph.D.

Art Unit

2815

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 19 July 2007.
- 2a) ☒ This action is **FINAL**. 2b) ☐ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1 and 3-20 is/are pending in the application.
- 4a) Of the above claim(s) _____ is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 1 and 3-20 is/are rejected.
- 7) ☐ Claim(s) _____ is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☒ The drawing(s) filed on 31 March 2005 is/are: a) ☒ accepted or b) ☐ objected to by the Examiner.
- Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
- Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☒ All b) ☐ Some * c) ☐ None of:
- 1) ☒ Certified copies of the priority documents have been received.
 - 2) ☐ Certified copies of the priority documents have been received in Application No. _____.
 - 3) ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- 1) ☒ Notice of References Cited (PTO-892)
- 2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
- 3) ☒ Information Disclosure Statement(s) (PTO/SB/08)
Paper No(s)/Mail Date 7/12/07.
- 4) ☐ Interview Summary (PTO-413)
Paper No(s)/Mail Date. _____
- 5) ☐ Notice of Informal Patent Application
- 6) ☐ Other: _____

DETAILED ACTION

1. **Claims 1 and 3-20** are pending in this application. Acknowledgement is made of the amendment received 7/12/07.

Response to Arguments

2. Applicant's arguments with respect to the rejections under the Gallagher reference (claims 1-6 and 11-16) have been fully considered but are moot in view of the new grounds of rejection necessitated by the amendment received 7/12/07.

3. In response to applicant's arguments against the references individually, one cannot show nonobviousness by attacking references individually where the rejections are based on combinations of references. See *In re Keller*, 642 F.2d 413, 208 USPQ 871 (CCPA 1981); *In re Merck & Co.*, 800 F.2d 1091, 231 USPQ 375 (Fed. Cir. 1986).

4. Per Applicants argument with respect to whether the Okazawa reference constitutes prior art under 102(b), the examiner notes that the Okazawa reference was not applied as a 102(b) reference, but rather, as a reference having a 102(e) date.

5. Applicant's arguments with respect to the rejections under the Okazawa reference (claims 19-20) have been fully considered have been fully considered but they are not persuasive. Applicant argues that the sidewall in the Okazawa reference is deposited differently than that of the instant application. However, when the claims are given their broadest reasonable interpretation, the device of Okazawa satisfies the claim language.

Information Disclosure Statement

6. Acknowledgment is made that an information disclosure statement has been received on 7/12/07 and considered by the examiner. If the applicant is aware of any prior art or any other

Art Unit: 2815

co-pending applications not already of record, he/she is reminded of his/her duty under 37 CFR 1.56 to disclose the same.

Specification

7. The objection to the specification has been withdrawn in light of the amendment received 7/12/07.

Claim Rejections - 35 USC § 112

8. The rejection under 35 U.S.C. 112, second paragraph has been withdrawn in light of the amendment received 7/12/07.

Claim Rejections - 35 USC § 102

9. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

(e) the invention was described in (1) an application for patent, published under section 122(b), by another filed in the United States before the invention by the applicant for patent or (2) a patent granted on an application for patent by another filed in the United States before the invention by the applicant for patent, except that an international application filed under the treaty defined in section 351(a) shall have the effects for purposes of this subsection of an application filed in the United States only if the international application designated the United States and was published under Article 21(2) of such treaty in the English language.

10. **Claims 1, 3, 5- 6 and 11-16** are rejected under 35 U.S.C. 102(b) as being anticipated by Gallagher et al. (US Patent No 5,650,958) hereinafter referred to as Gallagher.

11. Per **Claim 1** Gallagher (e.g. figure 8D) discloses a magnetic memory device, including

- a substrate;(9)
- a lower portion structure (including (12), (14), (16) and (18)) provided on or above said substrate as a portion of a magnetic element; said lower portion structure of said magnetic element comprising a first magnetic film (e.g. (14) or (18))

Art Unit: 2815

- an upper portion structure (including (32) (34) and (90)) provided on said lower portion structure of said magnetic element, said upper portion structure of said magnetic element comprising a second magnetic film (32)
- a sidewall insulating film (90) provided to surround said upper portion structure of said magnetic element
- wherein the lower portion structure has an outer circumference that is the same as an outer circumference of a bottom of the sidewall insulating film. (e.g. fig 8D)

12. Per **Claim 3** Gallagher (figure 8D) discloses the device of claim 1, including where said lower portion structure of said magnetic element further comprises a conductive portion (12), the first magnetic film (e.g. (14) or (18)) being provided on or above said conductive portion, and said upper portion structure of said magnetic element comprises an insulating film (20), the second magnetic film (32) being provided on said insulating film (20)

13. Per **Claim 5** Gallagher discloses the device of claim 1, including where said upper portion structure of said magnetic element comprises a conductive film (34) formed on said second magnetic film (32)

14. Per **Claim 6** Gallagher discloses the device of claim 1, including where a plane shape of said upper portion structure of said magnetic element is a rectangle. (column 11 lines 65-67)

15. Per **Claim 11** Gallagher discloses the device of claim 1, including where said sidewall insulating film (40) comprises at least one of silicon oxide, silicon nitride, aluminum oxide, and aluminum nitride. (column 5 lines 8-9)

16. Per **Claim 12** Gallagher (figures 8A-H) discloses method of manufacturing a magnetic memory device, including

Art Unit: 2815

- forming a multi-layer film included in a magnetic element on or above a substrate; (column 9 lines 34-36, see figure 8A)
- etching said multi-layer film into a predetermined pattern up to a predetermined depth, to form an upper portion structure of said magnetic element; (column 10 lines 1-14, see figure 8B-C)
- forming a sidewall insulating film to surround said upper portion structure of said magnetic element; (column 10 lines 23-26, see figure 8D)
- etching a remaining portion of the multi-layer film by using the sidewall insulting film and said upper portion structure of said magnetic element as a mask to form a lower portion structure of the magnetic element. (column 10 lines 23-26, see figure 8D)

17. Per **Claim 13** Gallagher discloses the device of claim 12, including where forming a multi-layer comprises:

- forming a conductive film (12) and a first magnetic layer (14) formed on or above said conductive film in a portion corresponding to said lower portion structure of said magnetic element;
- forming an insulating layer (20) and a second magnetic layer (32) formed on or above said insulating layer in a portion corresponding to said upper portion structure of said magnetic element.

18. Per **Claim 14** Gallagher discloses the device of claim 12, including where said etching said multi-layer film into a predetermined pattern, comprises: etching said multi-layer film into said predetermined pattern by using a physical etching. (Ar⁺ ion milling, column 10 lines 1-14)

Art Unit: 2815

19. Per **Claim 15** Gallagher discloses the device of claim 14, including where said physical etching is ion milling. (Ar+ ion milling, column 10 lines 1-14)

20. Per **Claim 16** Gallagher discloses the device of claim 12, including where forming a multi-layer comprises:

- forming a conductive film (12) in a portion corresponding to said lower portion structure of said magnetic element; and
- forming a first magnetic layer (18) an insulating layer (20) formed on or above said first magnetic layer; and a second magnetic layer (32) formed on or above said insulating layer in a portion corresponding to said upper portion structure of said magnetic element.

21. **Claim 4** is rejected under 35 U.S.C. 102(e) as being anticipated by N. Hiroshi (Japanese Patent No 2003-218431) hereinafter referred to as Hiroshi.

22. Per **Claim 4** Hiroshi (e.g. figures 1-8) discloses a magnetic memory device, including

- a substrate;(20)
- a lower portion structure (including (24a) and (26a)) provided on or above said substrate as a portion of a magnetic element; said lower portion structure of said magnetic element comprising a conductive portion [0026]
- an upper portion structure (including (28a), (30a), (32a) and (34a)) provided on or above said lower portion structure of said magnetic element, said upper portion structure of said magnetic element comprising a first magnetic film (32), an insulating film formed on or above said first magnetic film (32) and a second magnetic film (32) [0027-29]
- a sidewall insulating film (Ta) provided to surround said upper portion structure of said

magnetic element [0031]

- wherein the lower portion structure has an outer circumference that is the same as an outer circumference of a bottom of the sidewall insulating film. (e.g. fig 6)

Claim Rejections - 35 USC § 103

23. The text of those sections of Title 35, U.S. Code not included in this action can be found in a prior Office action.

24. This application currently names joint inventors. In considering patentability of the claims under 35 U.S.C. 103(a), the examiner presumes that the subject matter of the various claims was commonly owned at the time any inventions covered therein were made absent any evidence to the contrary. Applicant is advised of the obligation under 37 CFR 1.56 to point out the inventor and invention dates of each claim that was not commonly owned at the time a later invention was made in order for the examiner to consider the applicability of 35 U.S.C. 103(c) and potential 35 U.S.C. 102(e), (f) or (g) prior art under 35 U.S.C. 103(a).

25. **Claim 7** is rejected under 35 U.S.C. 103(a) as being unpatentable over Gallagher in view of Bhattacharyya et al. (US Patent No 6,297,983).

26. Per **Claim 7**, Gallagher discloses the magnetic memory device of claim 1 including and upper and lower portions on a magnetic element.

27. Gallagher does not disclose where a distance d on a plane between an the outer circumference the top of the lower portion structure and an outer circumference of an top of the upper portion structure of said magnetic element has a relation of $0.01 \mu\text{m} \leq d \leq 0.2 \mu\text{m}$

28. Bhattacharyya teaches a magnetic memory device with an upper and lower portion including where a distance c on a plane between an the outer circumference the top of the lower

Art Unit: 2815

portion structure and an outer circumference of an top of the upper portion structure of said magnetic element has a relation of $0.01 \mu\text{m} \leq d \leq 0.5 \mu\text{m}$. (see figure 6D below, and column 3 lines 62-65)

29. It would have been obvious for one having ordinary skill in the art at the time the invention was made to form the magnetic memory device such that the difference, d , in the outer diamters of the upper and lower portions of the device have the relation $0.01 \mu\text{m} \leq d \leq 0.5 \mu\text{m}$ as taught by Bhattacharyya for the device of Gallagher, in order to minimize the demagnetizing effects emanating from the edges of the magnetic layers in the device. (column 2 lines 61-63)

30. **Claims 8-9 and 19** is rejected under 35 U.S.C. 103(a) as being unpatentable over Gallagher in view of Okazawa et al (US Patent Application Publication No 2002/0146851) hereinafter referred to as Okazawa.

31. Per **Claims 8 and 19**, Gallagher discloses the device and method of claims 1 and 12, respectively, however, Gallagher does not teach forming an interlayer insulating film to cover said lower portion structure of said magnetic element, said sidewall insulating film, and said upper portion structure of said magnetic element; and forming a via-hole in said interlayer insulating film so as to be connected with said upper portion structure of said magnetic element by an etching method, said sidewall insulating film is formed of a material which has an etching selection ratio smaller than said interlayer insulating film

32. Okazawa (figure 2M) teaches an MRAM device including an interlayer insulating film (33) that covers the upper and lower portion structures as well as the sidewall film; and with a via hole (35) in the interlayer insulating film so as to be connected with said upper portion structure formed by an etching method, and where the sidewall film is formed of a material

Art Unit: 2815

which has an etching selection ratio smaller than said interlayer insulating film (column 11 lines 19-22)

33. It would have been obvious for one having ordinary skill in the art at the time the invention was made to include an interlayer insulating film to cover said lower portion structure of said magnetic element, said sidewall insulating film, and said upper portion structure of said magnetic element; and forming a via-hole in said interlayer insulating film so as to be connected with said upper portion structure of said magnetic element by an etching method, said sidewall insulating film is formed of a material which has an etching selection ratio smaller than said interlayer insulating film as taught by Okazawa for the device of Gallagher in order to make electrical contact with the device.

34. Per **Claim 9**, Gallagher discloses the magnetic memory device of claim 1, but fails to teach an interlayer insulating film formed to cover the upper and lower portion structure of said magnetic element and the sidewall insulating film; and said sidewall insulating film is formed of a material which has a selection ratio in a chemical mechanical polishing or an etching-back smaller than said interlayer insulating film.

35. Okazawa (figure 2L) teaches an MRAM device including an interlayer insulating film (33) formed to cover the upper and lower portions of a magnetic element and the sidewall insulating film; [0059] However, Okazawa does not teach where the sidewall insulating film is formed of a material which has a selection ratio in a chemical mechanical polishing or an etching-back smaller than said interlayer insulating film.

36. All of the component parts are known in Gallagher and Okazawa. The only difference is the combination of the old elements into a single device, by using the interlayer insulating film

Art Unit: 2815

of Okazawa in the device of Gallagher. It would have been obvious to one having ordinary skill in the art at the time the invention was made to use the interlayer insulating film of Okazawa in the device of Gallagher in order to achieve the predictable result of providing electrical insulation for the devices. Additionally, it would have been obvious to a person of ordinary skill in the art to try the the interlayer insulating film of Okazawa in an attempt to provide an improved semiconductor device, as a person with ordinary skill has good reason to pursue the known options within his or her technical grasp. *KSR International Co. v. Teleflex Inc.*, 550 U.S. -, 82 USPQ2d 1385 (2007).

37. Further, it would have been obvious to one of ordinary skill in the art at the time the invention was made to form the sidewall insulating film of a material which has a selection ratio in a chemical mechanical polishing or an etching-back smaller than said interlayer insulating film, since it has been held to be within the general skill of a worker in the art to select a known material on the basis of its suitability for its intended use as a matter of design choice. *In re Leshin*, 125 USPQ 416.

38. **Claim 10** is rejected under 35 U.S.C. 103(a) as being unpatentable over Gallagher in view of Durlam et al. (US Patent No 6,153,443).

39. Per **Claim 10**, Gallagher discloses the magnetic memory device of claim 1 including a sidewall insulating film.

40. Gallagher does not disclose where said sidewall insulating film is formed of at least one of metal nitride, metal oxide, and metal carbide

41. Durlam a magnetic memory device with a sidewall insulating film formed of a metal nitride. (column 4 lines 26-28)

Art Unit: 2815

42. It would have been obvious for one having ordinary skill in the art at the time the invention was made to form the sidewall insulating film of a metal nitride as taught by Durlam for the device of Gallagher in order to facilitate subsequent etching, patterning or fabrication steps.

43. **Claim 17-18** are rejected under 35 U.S.C. 103(a) as being unpatentable over Gallagher in view of Yoshida et al. (US Patent No 4,566,941).

44. Per **Claim 17**, Gallagher discloses the magnetic memory device of claim 16 including the etching of the multilayer film.

45. Gallagher does not disclose where each of said etching of a remaining portion of said multi-layer film is carried out by using a physical and chemical etching

46. Yoshida teaches the etching of a multilayer film using reactive ion etching, which is both a physical and a chemical etching method. (column 7 lines 11-14)

47. It would have been obvious for one having ordinary skill in the art at the time the invention was made to using a physical and chemical etching method to etch the multilayer film as taught by Yoshida for the device of Gallagher, since reactive ion etching method offers the advantage that an object body can be subjected to anisotropic etching without destroying a thin insulation layer included in said object body. (column 7 lines 11-14)

48. Per **Claim 18**, in so far as definite, the claim is rejected over prior art as follows:
Gallagher discloses the magnetic memory device of claim 16 including the etching of the multilayer film.

49. Gallagher does not disclose where each of said etching of a remaining portion of said physical and chemical etching is a reactive ion etching.

Art Unit: 2815

50. Yoshida teaches the etching of a multilayer film using reactive ion etching, which is both a physical and a chemical etching method. (column 7 lines 11-14)

51. It would have been obvious for one having ordinary skill in the art at the time the invention was made to using a physical and chemical etching method to etch the multilayer film as taught by Yoshida for the device of Gallagher, since reactive ion etching method offers the advantage that an object body can be subjected to anisotropic etching without destroying a thin insulation layer included in said object body. (column 7 lines 11-14)

52. **Claim 20** is rejected under 35 U.S.C. 103(a) as being unpatentable over Gallagher in view of Okazawa further in view of Tuttle (US Patent No 6,417,561).

53. Per **Claim 20**, Gallagher discloses the magnetic memory device of claim 12, however, Gallagher does not teach forming an interlayer insulating film to cover said lower portion structure of said magnetic element, said sidewall insulating film, and said upper portion structure of said magnetic element; and flattening said interlayer insulating film on said upper portion structure of said magnetic element by a chemical mechanical polishing method or an etching-back method, said sidewall insulating film is formed of a material which has a selection ratio in the chemical mechanical polishing method or the etching-back method smaller than said interlayer insulating film

54. Okazawa (figure 2M) teaches an MRAM device including an interlayer insulating film (33) that covers the upper and lower portion structures as well as the sidewall film; and where the sidewall film is formed of a material which has an etching selection ratio in the chemical mechanical polishing method or the etching-back method smaller than said interlayer insulating film (column 11 lines 19-22).

Art Unit: 2815

55. Okazawa does not teach the flattening said interlayer insulating film by a chemical mechanical polishing method or an etching-back method.

56. Tuttle teaches planarization of the top surface of an MRAM device by chemical mechanical polishing. (column 7 lines 51-55)

57. It would have been obvious for one having ordinary skill in the art at the time the invention was made to include an interlayer insulating film to cover the upper and lower portions structure of the magnetic element, as well as the sidewall insulating film, and to flatten the interlayer insulating film on said upper portion structure of said magnetic element by a chemical mechanical polishing method, where said sidewall insulating film is formed of a material which has a selection ratio in the chemical mechanical polishing method or the etching-back method smaller than said interlayer insulating film as taught by Okazawa and Tuttle for the device of Gallagher in order provide a flat topography. Planarization of the uppermost layers of such devices was a well known technique at the time the invention was made.

Conclusion

58. Applicant's amendment necessitated the new ground(s) of rejection presented in this Office action. Accordingly, **THIS ACTION IS MADE FINAL**. See MPEP § 706.07(a). Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire **THREE MONTHS** from the mailing date of this action. In the event a first reply is filed within **TWO MONTHS** of the mailing date of this final action and the advisory action is not mailed until after the end of the **THREE-MONTH** shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37

Art Unit: 2815

CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the date of this final action.

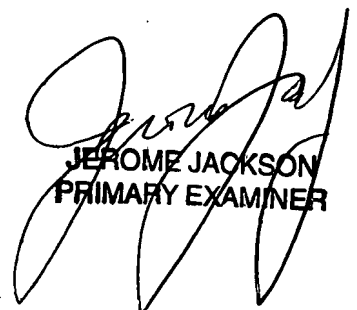
Any inquiry concerning this communication or earlier communications from the examiner should be directed to Jami M. Valentine, Ph.D. whose telephone number is (571) 272-9786. The examiner can normally be reached on Mon-Thurs 9:00am-6pm EST.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Kenneth Parker can be reached on (571) 272-2298. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

Jami M Valentine, Ph.D.
Examiner
Art Unit 2815

JMV


JEROME JACKSON
PRIMARY EXAMINER